The elaborate report on the fishes, by Professor David S. Jordan, occupying more than two hundred and fifty pages, gives an interesting history of Ohioan ichthyology, with descriptions of all the species as well as of the principal genera and higher groups. It appears that the fauna has been increased from the sixty-six species known to Dr. Kirtland (1840–1846) to a hundred and sixty-five. A useful tabulated synopsis exhibits in four parallel columns the names admitted by Rafinesque, Kirtland, and Günther, as well as Jordan. The fauna is also disintegrated into its several elements, — the Lake fauna (26 sp.), the Ohio-river fauna (37 sp.), and the 'species of general distribution' (28 sp.) 'As an illustration of the character of the local fauna of the smaller streams of the interior,' a list of the species (68) occurring in the White River, near Indianapolis, is added, with notes as to their comparative abundance or rarity.

The typography, although good for a public document, could not be accorded much excellence were the work issued by a private publisher; and the press-work is very unsatisfactory. The synonymy of species is printed in much too large type in the division on the mammals, although afterwards changed. This inequality is unsightly; and numerous typographical errors occur.

GEIKIE'S GEOLOGICAL SKETCHES.

Geological sketches at home and abroad. By ARCHIBALD GEIKIE, LL.D., F.R.S., director of the Geological survey of the United Kingdom. New York, *Macmillan & Co.*, 1882. 370 p. 8°.

IN this pleasant volume, well illustrated by the author's pencil, Prof. A. Geikie has gathered together a number of sketches, essays, and addresses, picturesque, descriptive, and historical, published during the past twenty years in various journals, and all written with some reference to the science of geology, of which he has been so successful a cultivator. Some of these papers have little more than a local and popular interest, but are gracefully written, and well suited to give the unscientific reader a taste for geological studies. Others have a higher significance, and raise questions which are of importance to all students of geology, and would require for their adequate discussion more space than we can here command.

One of the most interesting of these papers is that entitled 'A fragment of primeval Europe,' in which we are introduced to the crystalline rocks of north-western Scotland and the adjacent isles. These ancient gneissic and granitoid strata, first critically studied by MacCulloch, were early recognized as the lithological and mineralogical analogues of the primitive gneisses of Scandinavia and parts of North America; and in 1855, after the name of Laurentian had been given to the latter, it was suggested that the name should be extended to the similar rocks of Scotland, which Murchison had called the fundamental gneiss, — a suggestion since adopted. The aspect of the region occupied by these ancient rocks is peculiar. "The whole landscape is one of smoothed and rounded bosses and ridges of bare rock, which, uniting and then separating, enclose innumerable little tarns. There are no definite lines of hill and valley: the country consists, in fact, of a seemingly inextricable labyrinth of hills and valleys, which, on the whole, do not rise much above, nor sink much below, a general average level." No peaks nor crags are seen; and "the domes and ridges present everywhere a rounded, flowing outline." The whole area is, according to our author, smoothed, polished, and striated, as if ice-worn, and presents, in fact, a typical glaciated surface. Over this 'tumbled sea of gray gneiss' rise conical mountains of nearly horizontal, dark-red sandstone, capped by white quartzites, the summits sometimes attaining 3,400 feet above tide-water. Two good woodcuts serve to illustrate the peculiarities of this curious landscape.

These uncrystalline, unconformable beds of Cambrian age, dipping gently eastward, are succeeded by fossiliferous limestones belonging to the same period, which, in the same direction, appear to pass below a series of flaggy gneisses and crystalline schists, the age of which has been a burning question among British geologists. The problem regarding them is identical with that which has been raised in New-England geology; namely, whether the crystalline schists, towards and beneath which the fossiliferous paleozoic rocks lying to the westward are seen to dip, are newer or older than these. Professor Geikie, for Scotland, holds to the former view, and supposes these crystalline rocks in the Highlands to be formed from a subsequent alteration of still younger paleozoic strata: but in Scotland, as in New England, the opposite view is now, by most geologists, held to be established; namely, that the crystalline rocks in question are pre-Cambrian, and in that sense a part of the 'primeval' world.[1]

Geikie shows that the sculpturing of the

[1] Geological magazine, February, 1883, p. 83.

surface of the Laurentian gneiss of western Scotland was anterior to the deposition of the Cambrian sandstones, and that there are minor domes and bosses of crystalline rock, continuous with those of the exposed surfaces supposed to bear the marks of modern glacial action. The conclusion from this would seem to be, that the latter agency has done little more than groove and polish these ancient rounded surfaces, from which a later erosion had removed the covering sandstone. Whether the pre-Cambrian erosion was glacial is a question which Geikie does no more than suggest. In this connection, the existence of a state of chemical decay as a necessary preliminary to the erosion of crystalline rocks should not be lost sight of.[1] We believe that such a process predetermined the contours of their present eroded surfaces.

The question of the erosion of ancient land-surfaces is further discussed by Geikie in a lecture here republished, given by him before the Royal geographical society in 1879, on The geographical evolution of Europe. In this, by aid of the data of geology, he gives a chapter on what has elsewhere been called paleogeography. Geikie shows that the fragment of primeval Europe already noticed, was a part of a great pre-Cambrian area, to which parts of Finland and Scandinavia belonged, and from which was derived the sediments that built up the Cambrian and Silurian series of Great Britain and western Europe. These lower paleozoic rocks in Great Britain alone, he assumes to cover an extent of 60,000 □ miles, with an average thickness of 16,000 feet, or 3 miles, which figures he considers below the mark, — making not less than 180,000 cubic miles, equal to a mountain range from the North Cape to Marseilles, or 1,800 miles long, 3 miles high, and 33 miles wide. This, he well remarks, represents but a fraction of the material thus derived; since in the seas of that time, extending far eastward, were also laid down great thicknesses of paleozoic rocks, continuous with those of the British isles. Calculations of this kind, applied to North America, give us still larger notions of the erosion of great pre-Cambrian areas belonging to some Palae-Atlantis.

It would be profitable, with Geikie's sketches as our guide, to glance at the glaciers of Norway, the ancient volcanoes of Auvergne and of north-western Europe, and to accompany him, in his excursion in 1880, into our western states, where his quick eye readily comprehended many of those remarkable characteristics which make the transcontinental journey from the Atlantic to the Pacific a geographical education.

In his lecture on assuming his late post of professor of geology at Edinburgh, in 1871, Geikie has happily delineated the characters of the Scottish school of geology, and traced many of the characteristics of its masters — Hutton, Playfair, and Sir James Hall — to the local peculiarities of their native land, with its crystalline, contorted, and unfossiliferous rocks, so unlike the regions in which the early Italian school laid the foundations of geology. It is instructive, in this connection, to reflect how the great and simple outlines of American paleozoic stratigraphy, as displayed in the Appalachian basin, led to the grand conceptions of structural geology formulated by the brothers Rogers, by James Hall, and by Lesley, and how the remarkable features of our western regions have taught our geologists of the younger generation lessons which have enabled them so greatly to advance the science, and to correct the views of their predecessors, both in the old and the new world.

We hope on another occasion to notice more in detail some of the questions raised in this instructive volume, in which every student of geology will find something to instruct him, and to stimulate thought.

[1] Harper's annual record of science, etc., 1873, p. xlix.

VERTEBRATE ANATOMY.

A handbook of vertebrate dissection. Part ii. How to dissect a bird. By Prof. H. NEWELL MARTIN and Dr. WILLIAM A. MOALE. New York, *Macmillan*, 1883. 4 + [86] p., 3 pl. 12°.

THIS second part of the handbook is quite up to the standard of the first. It is comprehensive, without going beyond its intended limits; the descriptions are clear and well-worded; the subjects selected for illustration are those most needing it, viz., the more complex parts of the skeleton; and the diagram constituting figure 5 will prove very useful in clarifying certain ideas of the learner.

The method of treatment is well calculated to bring out the observational power of the student; and the fact that the avian, rather than the generic and specific characters, are made prominent, renders the book much more widely useful, and also serves to commend it to practical workers in zoölogy. With the other books of this series, which are to treat in a similar manner of a rat, a bony and cartilaginous fish, and one of the large, tailed amphibia, or Urodela, we shall be supplied with a book which has long been needed in America.